

Title: Apparatus for conveying objects

The present invention relates to an apparatus according to the preamble of claim 1.

Such an apparatus is known from EP 687508 of applicant. The sorting machine described therein comprises, substantially, two endless conveyors, i.e. a first roller conveyor and a second roller conveyor starting above an end part of the roller conveyor, having grippers as carrier elements which grippers each consist of a combination of two gripper halves for carefully transferring articles, objects or products such as fruit, more in particular apples, pears, paprika's, kiwis, peaches *et cetera*, from the roller conveyor and conveying these further to the proper unloading station for further discharge and packaging. Especially in the market of sorting delicate products such as fruits, this machine has yielded good results because with these grippers, damaging the products to be transferred is prevented and avoided to a large extent.

However, it will be clear that with objects of different sizes, gripping may still lead to damage. With large fruits for instance, the springy, clamping action of the gripper halves may produce sleepy spots, while small fruits such as kiwis, after being transferred, can still roll from the halves as the ends of the gripper halves contact each other at their bottom sides, thereby gripping the kiwis as such less well.

In order to further improve the above-outlined construction for conveying in particular delicate objects, the apparatus according to the present invention is characterized in that, at least in the surfaces which support the objects at the moment of transfer by at least one single gripper hand, the conveying elements comprise grooves in a direction perpendicular to the conveyor, and in that the gripper hand comprises fingers, while the distance between the fingers corresponds to the distance between the grooves of the conveying elements such that upon transfer of the objects by the gripper hand,

the fingers are positioned at least partly below the objects in the groove ends of the grooves.

With great advantage, this combination of conveying elements with grooves and the gripper hand mentioned can transfer any type of fruit so that 5 sorting machines provided with such combinations will find general utility. In a very suitable manner, the gripper hand forms a cup-shaped support, thus avoiding any clamping engagement.

In a further embodiment, the invention is characterized in that the conveying elements are diabolos with circumferential surfaces of which at least 10 one half is provided with grooves, while the diabolos are further provided with guides for directing the diabolos while the guides are passed over a transfer guide and such one half is positioned at the upper side.

What is thus achieved in a suitable manner is that the conveying elements and gripper hands will always assume the correct position relative to 15 each other.

In particular, the invention is characterized in that the grooves substantially consist of groove ends which are in one line.

In a further elaboration, the product carrier for a single product or object comprises two gripper hands which are moved from both sides from the 20 groove ends inwards and which, upon transfer, support the product or object.

More in particular, the two conveyors are positioned in one line, one above the other, while the gripper hands are virtually of the same size, the gripper hands being connected to a weighing unit while an upward guide is provided with which, at least virtually immediately after transfer of an object 25 by the gripper hands, the gripper hands are guided upwards, while the gripper hands hold the transferred object at at least a limited distance above the conveying elements.

With this last feature it is achieved in a suitable manner that immediately after transfer of the objects, no further damage will occur because

the paths followed by the gripper hands on the one side and the conveying elements on the other side are completely separated.

The present invention will be elucidated with reference to a drawing.

In the drawing:

5 Fig. 1 shows a perspective view of the conveying elements of the first conveyor;

Fig. 2 shows a perspective view of two conveying elements of the first conveyer, in combination with the gripper hands connected to the second conveyor; and

10 Fig. 3 shows a side view of the conveying elements and the gripper hands prior to, during and after transfer of objects.

In the different Figures, the same parts have the same reference numerals.

15 In Fig. 1, an object 1, for instance products or articles such as fruits or balls, are on two conveying elements 2, together defining a conveying position. In the embodiment shown, the conveying elements are formed by diabolos, each having an axle 3, typically serving as rotation axis with which the diabolos, and hence the conveyed objects, rotate, for instance for inspection when passing cameras.

20 With these axles 3, generally positioned horizontally, the diabolos are connected to an endless conveyor (not shown) with which the objects 1 can be conveyed to, for instance, discharge units, in particular discharge or packaging paths, for further treatment, in particular packaging. Parallel to the axles and perpendicular to the conveying direction, grooves 4 have been 25 provided in these diabolos 2, the grooves having groove ends 6. In the elaboration shown, no continuous grooves are used, but the grooves substantially consist of groove ends 6 which are in line with each other. In the elaboration shown, it can be seen that both diabolo halves 5 are provided with such grooves.

In Fig. 2, the diabolos 2, now provided with grooves on only a part of the supporting surface, are represented in combination with gripper hands 7. These gripper hands 7 have fingers 8 at their ends, the fingers being positioned precisely above the grooves. At the location of the conveying 5 position, in the middle, a somewhat larger finger has been provided. In the situation represented here, both gripper hands are equally large and are carried along by and connected to an endless conveyor (not shown) which is arranged above, and in line with the conveyor of the conveying elements. The opened position is shown from which the gripper hands can be moved towards 10 each other, with the fingers in the grooves, and can thus support an object or product.

In Fig. 3, again, the combination is shown in a side view. What is shown is the situation just prior to, during, and just after transfer of the objects 1 by the gripper hands 7. Objects 1 are partly on diabolos carried along 15 by the first endless conveyor, and are partly transferred by the gripper hands 7 of the second endless conveyor. Further, a transfer guide 10 is represented, more in particular a gradient against which guides 9 on the sides of the diabolos rotate so that the diabolos are directed such that the halves 5 are positioned having the grooves at the upper side. As the gripper hands 7 and 20 the grooves are exactly in line, when the two gripper hands move towards each other, the fingers will be slid exactly into the grooves and hence be able to support and transfer the objects 1. Immediately afterwards, the gripper hands will be guided upwards by an upwards guide (not represented) in the direction indicated by the arrow in this Figure, so that the objects transferred by the 25 gripper hands are positioned at at least a limited distance above the first conveyor. Any damage that may occur is thus prevented.

Not shown as an exemplary embodiment in a Figure is the embodiment in which per gripper, instead of two gripper hands, one gripper hand is provided, the diabolo roller conveying first conveyor and the gripper 30 hand conveying second conveyor being arranged next to each other, while the

objects are lifted from the first conveyor by the one gripper hand which is provided with fingers that can reach into grooves in the diabolos.

Nor is there a detailed description of manners of moving and displacing the gripper hands. This can be effected in many manners. For 5 instance with cams and cam following elements, or also with springs, in particular draw springs or compression springs, depending on the manner of attaching and locking thereof.

It will be clear to any skilled person that minor modifications in the elaborations represented are possible without falling outside the range of the 10 annexed claims.